

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

GRASSED WATERWAY

(acre)
CODE 412

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.

PURPOSE

- Convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding
- Improve water quality
- Improve wildlife habitat

CONDITIONS WHERE PRACTICE APPLIES

All sites where added capacity, vegetative protection, or both are required to control erosion resulting from concentrated runoff and where such control can be achieved by the use of this practice alone or combined with other conservation practices. Soil conditions must be satisfactory for producing the required vegetative cover.

Grassed waterway shall not be installed where it would destroy important woody wildlife cover and where the present watercourse has little or no erosion. When encountered, wetlands will be treated in accordance with current NRCS wetlands policy. Refer to NRCS booklet "Wetland Types in Missouri," or

Fish and Wildlife Circular 39 for classification.

DESIGN CRITERIA

General. The grassed waterway drainage area shall have adequate land treatment measures in order to minimize soil erosion; thus controlling potential sedimentation sources.

All planned work shall comply with Federal, state, and local laws and regulations.

Capacity. The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. When the grassed waterway flowline grade is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum in such cases shall be the capacity required to remove the water before crops are damaged. Use appropriate drainage curve from the Missouri Supplement to National Engineering Handbook (NEH), Part 650, Engineering Field Handbook (EFH), Chapter 14, for minimum capacity.

For concentrated flow areas having drainage areas of 5 acres or less, refer to Conservation Practice Standard (342) Critical Area Planting for an alternative method of grassed waterway design.

Velocity. Design velocities shall not exceed those obtained by using the procedures, "n" values, and

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

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recommendations in the EFH; NRCS-TP-61, Handbook of Channel Design for Soil and Water Conservation; or ARS Agricultural Handbook Number - 667, Stability Design of Grassed-Lined Open Channels.

Design velocities shall be within the permissible velocities shown in the EFH. Erosion resistant soils are generally those with a higher clay content and higher plasticity. Typical soil textures are silty clay, sandy clay and clay. Minimum design velocity should be 1.5 feet per second.

Cross section. Vegetated waterways may be either parabolic or trapezoidal in shape. Parabolic cross section shall be proportioned as shown in Chapter 7, EFH.

The required waterway size may be determined from the appropriate table in Chapter 7, EFH. NRCS-TP-61 or ARS-AH-667 may be used to size the waterway when conditions beyond the limits of the tables exist.

The required waterway shall be divided into design reaches if applicable. The channel cross section shall be adjusted to account for changes in flowline grade or increase in drainage area.

Width. The bottom width of trapezoidal waterways shall not exceed 50 feet unless multiple or divided waterways or other means are provided to control meandering of low flows. The vegetated earth divider shall be a minimum of 0.4 foot high and have sideslopes of 4 (horizontal - H):1 (vertical - V) or flatter.

Sideslopes. Side slopes for trapezoidal waterways shall not be steeper than a ratio of 4 (H):1 (V). They should be designed to accommodate the land user's equipment.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at, or below, the design water surface

elevation in the terrace, diversion, or other tributary channel at their junction when both are flowing at design depth. A minimum of 0.3 foot drop shall be provided from the terrace or diversion channel flowline to the waterway channel flowline.

Drainage. Subsurface drains (606), underground outlets (620), stone center waterways, or other suitable measures shall be provided in the design for sites having prolonged flows, a high water table, or seepage problems. Water-tolerant vegetation such as Reed's canarygrass may be an alternative on some wet sites.

Side dikes. Permanent earth side dikes, when used, shall be of proper height to provide the design depth of the waterway. These dikes shall have a top width of at least 1 foot and side slopes of 4 (H):1 (V) or flatter.

Temporary earth side dikes may be installed, when required, to protect a new waterway from erosion due to runoff from adjacent areas. These dikes shall be shown on the drawings as 1 foot or less in height unless design calculations indicate dikes of greater height are needed. All temporary dikes over 1 foot in height shall be designated on the drawings and documentation for the higher dike recorded in the design file. The higher dikes shall only be required on that portion of the waterway where they are justified. Producers may choose to construct dikes over 1 foot in height for their convenience. Temporary dikes shall be removed when vegetation in the waterway becomes established.

Outlets. All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earth ditch, a grade stabilization structure, or other suitable outlets.

Geotextile erosion control. Recommendations for use of geotextile erosion control linings for waterway seeding establishment and repair are shown in the following table. Geotextile

erosion control products are recommended if both factors are met --

FACTOR	SOIL ERODIBILITY	
	EASILY ERODIBLE	EROSION RESISTANT
Quality of grass lining	Poor	Poor
Channel Velocity	Greater than 4 feet per second with "E" Retardance	Greater than 6 feet per second with "D" Retardance

Use geotextile erosion control products in the middle one-third of the width for parabolic shape cross section and one-half the depth up on sideslopes and across bottom width for trapezoidal shape.

VEGETATION

Grassed waterways will be vegetated according to Conservation Practice Standard (342) Critical Area Planting. The use of geotextile erosion control products can aid in the establishment of vegetation especially in conjunction with mulching.

CONSIDERATIONS

Evaluate potential impact on water quality due to agri-chemicals in outflow.

The most critical time in successfully installing grassed waterways is when vegetation is being established. Special protection such as mulch, anchoring, straw or hay bale dikes, or other diversion methods are warranted at this critical period. Supplemental irrigation may also be appropriate. The vegetation should be well established

before large flows are permitted in the channel.

Grassed waterways serving as outlet(s) for gradient terraces or any other open channel conveyances shall be well established prior to other runoff entering the grassed waterway.

Special attention shall be given to maintaining and improving visual resources and habitat for wildlife where applicable.

The soil loss from the watershed draining into the waterway must be evaluated when the sedimentation from upland erosion on land not controlled by the landowner/user. Excessive soil loss will impair the proper functioning of the waterway. The waterway should not be constructed until structural measures, appropriate land use, and management changes have been made to reduce the erosion to an acceptable level.

PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

A maintenance program shall be established to maintain grassed waterway capacity, vegetative cover, and the outlet. Vegetation damaged must be repaired promptly. University of Missouri Agricultural Guide 1504 "Maintaining Grassed Waterways" provides information on the maintenance of grassed waterways.

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**NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI OPERATION AND MAINTENANCE**

**FOR
GRASSED WATERWAY**

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Additional details:

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**NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION**

**FOR
GRASSED WATERWAY**

General

Construction operations shall be carried out in such a manner and sequence such that erosion and air and water pollution will be minimized and held within legal limits. A land disturbance permit from the Missouri Department of Natural Resources may be needed if the disturbed area is greater than five acres in size.

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used. The contractor shall be assured that all state laws concerning buried utilities are met prior to beginning work.

Construction shall be according to the requirements as specified in the plans and specifications.

Site Preparation

All trees, stumps, roots, brush, weeds, and other unacceptable material shall be removed from the site and disposed of without degrading the environment or visual resources.

Waterway Construction

When subsoil material in the waterway is inadequate to establish a good seed-

bed, the best available soil will be stockpiled and respread uniformly to a depth of at least six (6) inches over the waterway, which will be undercut to accommodate the stockpiled soil material. The excavated material shall be deposited in side dikes or low areas in the field where it will not interfere with the flow of water into the waterway and will compliment normal use of the land. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the completed waterway.

The waterway shall be shaped to the grade, width, and depth shown on the drawings. The waterway shall be constructed so the design top width occurs at the design water depth measured from the bottom of the constructed waterway.

Temporary dikes, high enough to divert runoff water from the new grass seeding until the vegetation is well established, may be constructed around the top and sides of the waterway. These dikes shall be removed when vegetation is established.

Seeding and Mulching

Topsoil shall be added, if needed, to establish vegetation. Refer to JS-AGRON-25 or equivalent for seeding and mulching recommendations.

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Additional details:
